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(54) Generating a video stream object in a data editing system

(57) A desired video stream object is created from multimedia data in a data editing system. Primitive objects having a rectangular object, a position object and an interval object are extracted from the multimedia data. Media objects are then created by extracting spatial and temporal features based on the multimedia data and the primitive objects. Temporal relations among the media objects are determined wherein each temporal relation represents a playback start time and a playback length of a corresponding media object and a time scale object is created to adjust the playback length of the corresponding medium based on the temporal relation thereof. A spatial scale object is created to control the size of a region of a corresponding medium being represented on a screen of the system based on the spatial relation thereof. The desired video stream object is created based on the temporal relations and the temporal scale object and the spatial relations and the spatial scale object.

FIG. 1

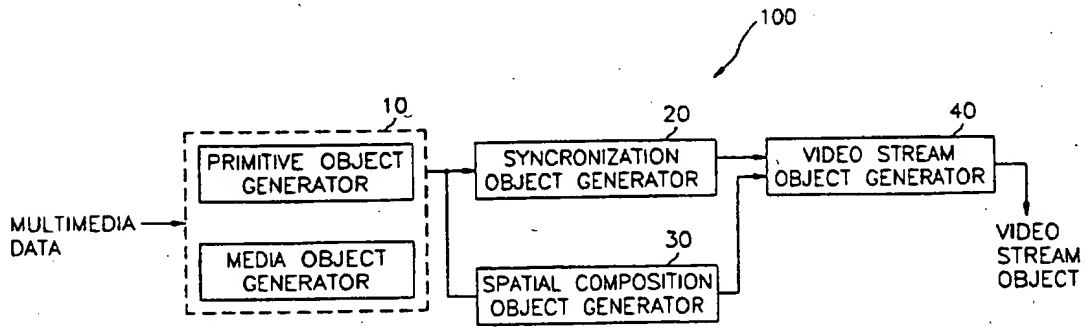

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FIG. 1

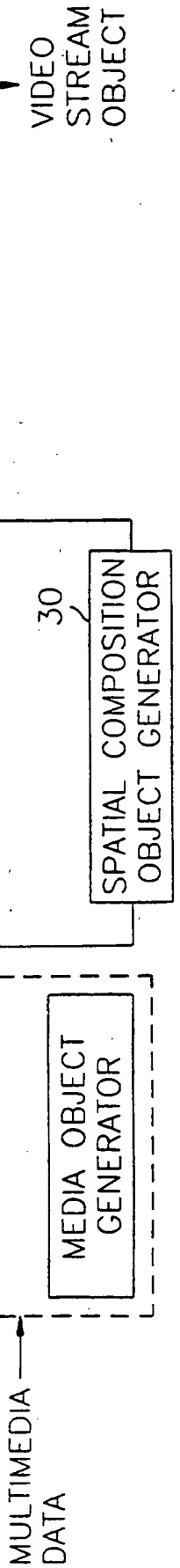


FIG.2

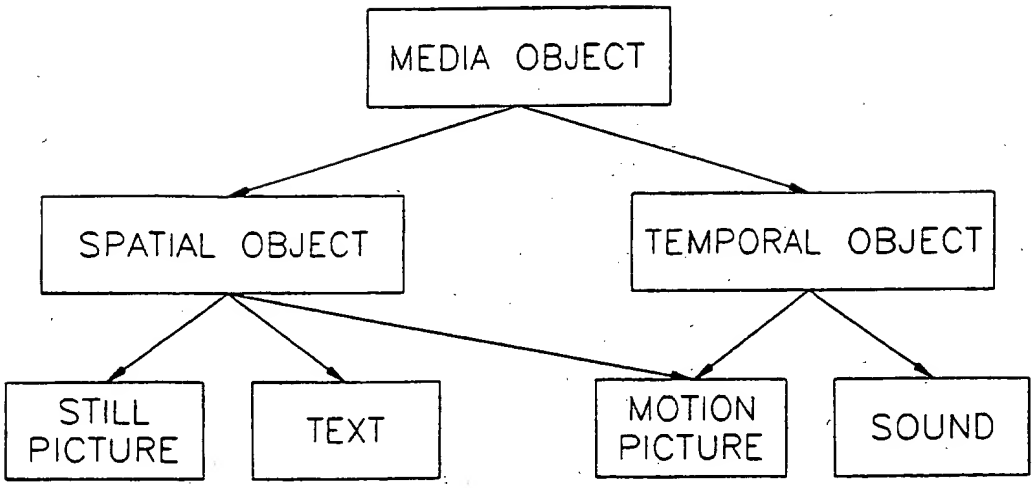


FIG. 3

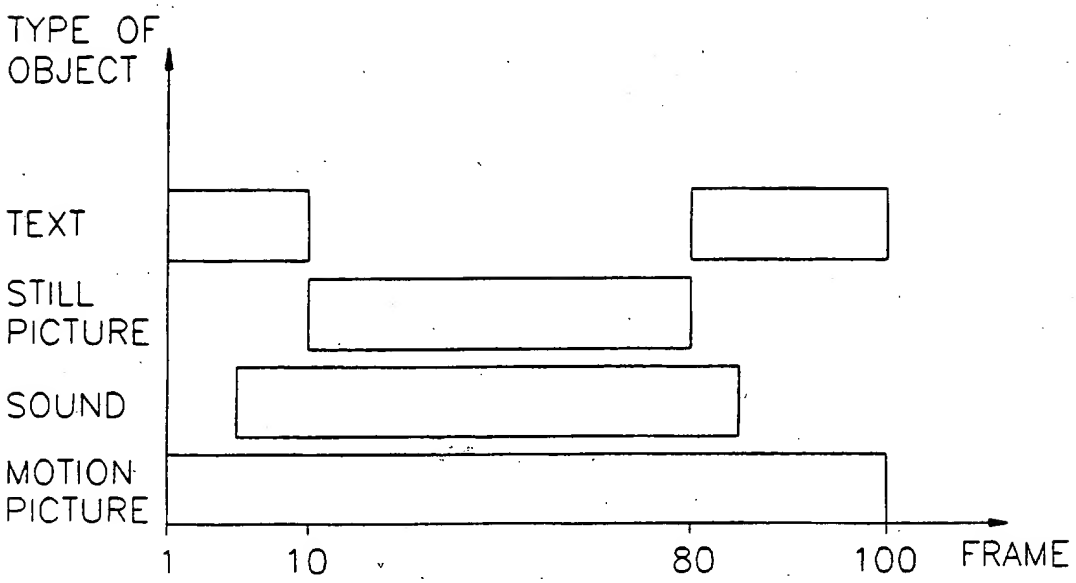
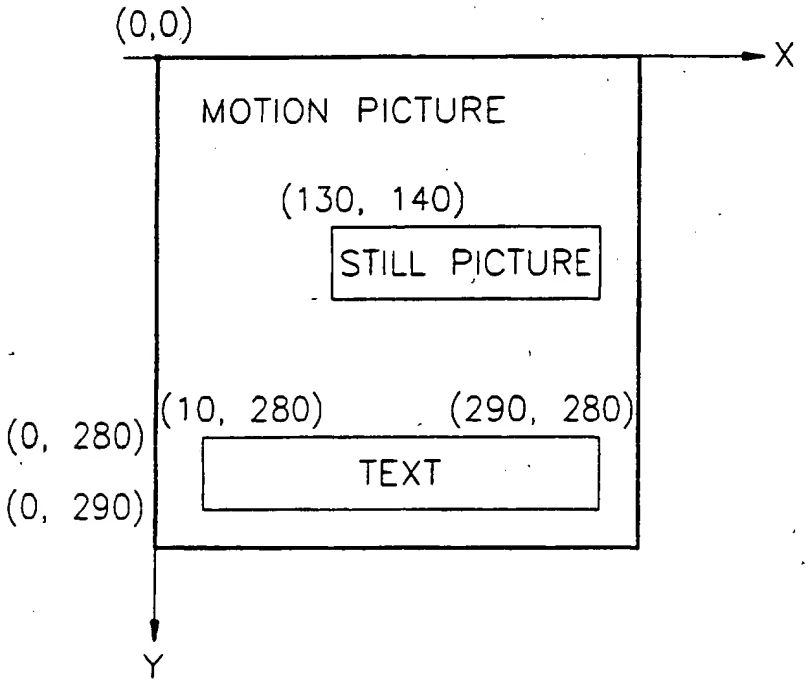


FIG. 4



METHOD AND APPARATUS FOR GENERATING A VIDEO STREAM OBJECT IN A DATA EDITING SYSTEM

The present invention relates to a data editing system; and, more particularly, to a method and apparatus for generating a desired video stream object from multimedia data in the data editing system.

In recent years, editing technology to manipulate multimedia documents that include picture, audio, text, and other modifiable objects has achieved a significant progress.

Among the various editing techniques, there are in particular two kinds of editing techniques that have been widely used: a video algebraic editing technique and a hierarchical multimedia document data editing technique. The video algebraic editing technique carries out such functions as creation, output, explanation, composition and the like to manipulate video streams of motion pictures. The creation function serves to create an input video for editing and the output function is to simultaneously output the video streams by employing several preset windows. And the explanation function adds, to each video stream, additional information for explaining it; and the composition function processes one or more video stream data by using preset operators, e.g.,

continuation, summation, crossing, subtraction, repeating, extension, limitation and the like. Using the above-mentioned functions, it is possible to edit a desired video stream and change its contents by properly composing more than one video stream data. However, the prior art algebraic editing technique does not provide an editing scheme for media, e.g., still picture, text, sound and animation, which are not the video stream data of the motion picture.

The hierarchical multimedia document data editing technique has been developed to solve the above problem in the algebraic editing technique. The hierarchical multimedia document data editing technique employs four hierarchical layers, i.e., a definition layer, a manipulation layer, a presentation layer and a control layer. Specifically, the definition layer deals with the definition of a class to which an object of multimedia document data belongs; and the manipulation layer handles temporal features between objects in the multimedia document data. An object having the temporal feature refers to an event, wherein operators such as concatenation, overlay, extension and insertion are used. Further, at the presentation layer, user interface components are defined, wherein the components may include a spatial layout between the objects, output type, window and icon. At the control layer, an interaction between a user and each of an input and an output sections is defined.

However, in such a hierarchical editing technique, the

multimedia document data is processed, using the four layers, without taking into account temporal and spatial relations among media objects on the basis of motion picture, thus making it difficult to meet the requirement for synchronization between the motion picture and each of the media objects.

It is, therefore, a primary object of the present invention to provide a method and apparatus which is capable of creating a desired video stream object with an accurate synchronization between media objects therein by taking into account temporal and spatial relations between a motion picture and the media objects.

In accordance with one aspect of the present invention, there is provided a method for generating a desired video stream object from multimedia data having the form of a video stream in a data editing system, comprising the steps of:

(a) extracting primitive objects having a rectangular object, a position object and an interval object by using head information in the multimedia data;

(b) creating media objects based on the multimedia data and the primitive objects, wherein the media objects are classified into temporal and spatial objects;

(c) determining temporal relations among the media objects, wherein each temporal relation represents a playback

start time and a playback length of a corresponding media object on the basis of a motion picture object out of the media objects and creating a temporal scale object to adjust the playback length of the corresponding media object based on the temporal relation thereof;

(d) determining spatial relations among the media objects wherein each spatial relation represents a position and a size of a region of a corresponding media object being represented on a screen of the system and creating a spatial scale object to control the size of the region based on the spatial relation thereof; and

(e) creating the desired video stream object based on the temporal relations and the temporal scale object and the spatial relations and the spatial scale object.

In accordance with another aspect of the present invention, there is provided an apparatus for generating a desired video stream object from multimedia data having the form of a video stream in a data editing system, the apparatus comprising:

means for extracting primitive objects having a rectangular object, a position object and an interval object by using head information in the multimedia data and creating media objects based on the multimedia data and the primitive objects, wherein the media objects are classified into temporal and spatial objects;

means for determining temporal relations and spatial

relations among the media objects wherein each temporal relation represents a playback start time and a playback length of a corresponding media object on the basis of a motion picture object out of the media objects and each spatial relation depicts a position and a size of a region of a corresponding media object being displayed on a screen of the system;

means for creating a time scale object to adjust the playback length of the corresponding media object based on the temporal relation thereof and creating a spatial scale object to control the size of the region of the corresponding media object based on the spatial relation thereof; and

means for generating the desired video stream object based on the temporal and the spatial relations and the temporal and the spatial scale objects.

The above and other objects and features of the present invention will become apparent from the following description of preferred embodiments given in conjunction with the following accompanying drawings, in which:

Fig. 1 shows a block diagram of a video stream object generation apparatus in a data editing system in accordance with the present invention;

Fig. 2 presents an exemplary drawing for describing a hierarchical structure of a media object in accordance with

the invention; and

Figs. 3 and 4 offer illustrative drawings for explaining temporal and spatial relations between media objects in accordance with the invention, respectively.

Referring to Fig. 1, there is shown a block diagram of a video stream object generation apparatus 100 for generating a desired video stream object from multimedia data in a data editing system in accordance with the present invention. As will be fully described below, the present invention employs an objected-oriented multimedia data editing scheme which takes account of temporal and spatial relations between media objects. The video stream object generation apparatus 100 of the invention comprises a media object generation device 10, a synchronization (SYNC) object generator 20, a spatial composition object generator 30 and a video stream object generator 40.

Multimedia data is first applied to the media object generation device 10 in the form of a video stream, wherein the multimedia data is non-structured data consisting of media such as a motion picture, a still picture, a text, a sound and the like. The multimedia data may be stored in advance in a database (not shown) associated with the device 10 or a storage unit similar to the database. At the media object generation device 10, media objects are created by using the

multimedia data. For the creation of the media objects, first of all, primitive objects such as a rectangular object, an interval object and a position object are set at a primitive object generator included in the media object generation device 10.

Among the primitive objects, the position object and the rectangular object depict a position and a size of a region where a spatial media, as will be discussed below, is being represented on a screen (not shown) associated with the inventive apparatus 100, respectively. To be more specific, the position of the region is expressed as a coordinate (X, Y) on a horizontal and a vertical axes, whereas the size thereof is defined as a function of a horizontal and a vertical lengths in units of pixel on the horizontal and the vertical axes. In the coordinate, a reference point is a point positioned at an upper left corner of the region. And the interval object stands for a playback interval of a temporal media, as will be discussed below. The playback interval is expressed as a function of a playback start point and a playback end point of the temporal media, wherein units of the start and the end points are second. The horizontal and the vertical lengths and the start and the end points may be obtained by extracting corresponding data in head information of the multimedia data.

For the creation of the media objects, a specific or interest region object is further set by the user, wherein the

specific or interest region stands for a region where the user regards it as an interest or importance region within a region of media being represented on the screen. The specific region of a temporal object is expressed as a function of an interval object which is newly set by the user, while the specific region of a spatial object is defined as a function of a rectangular object and a position object which are also newly set by the user. These temporal and spatial specific region objects are used for the user to adjust a playback length and a representation region of respective corresponding media, respectively, to obtain a desired video stream object. Once the specific region objects are created with respect to each media object, the remaining region excepting the specific regions is decided to be an auxiliary region object.

After creating the primitive objects and the specific region objects, the media objects are now created by using the objects at a media object generator included in the media object generation device 10. A media object has a hierarchical structure as illustrated in Fig. 2. In other words, the media object is classified into two types of objects, a temporal object and a spatial object. The temporal object contains temporal features such as a playback length and a playback speed of each temporal media and the spatial object contains spatial features such as information related to a region or portion of each spatial media being displayed on the screen. As shown in Fig. 2, it is known that the

motion picture object contains attributes of both of the temporal object and the spatial object, while the still picture object and the text object contain attributes of only the spatial object and the sound object contains attributes of only the temporal object. Further, it is possible to create the text object by applying contents, font, color, rectangular, etc. of words therein to a text generator (not shown) contained in the media object generator. Data on each of the primitive objects, the specific region objects and the media objects, created at the media object generation device 10, is then provided to the SYNC object generator 20 and also to the spatial composition object generator 30.

At the SYNC object generator 20, temporal relations between the media objects are first determined based on the motion picture object. Each of the temporal relations refers to a function of a playback start frame and a playback length of a corresponding one of the media objects on the basis of the motion picture object. Fig. 3 shows the temporal relations between the motion picture object and each of the text, the still picture and the sound objects, wherein the horizontal axis represents the number of frames and the vertical axis indicates the type of object. In Fig. 3, for instance, the playback start frames of the text object are a 1st one and an 80th one, respectively, and the playback lengths thereof are 10 frames and 20 frames, respectively.

After determining the temporal relations, in a preferred

embodiment of the invention, the playback length of each temporal media object is adjusted by using a temporal scale object which will fully be described hereinafter. The time scale object is used to adaptively adjust the temporal feature of each media object to satisfy the requirements of specification defined in the motion picture object. The time scale object is expressed as a function of a name of a media object and a time scale adjustment technique. There are two types of temporal scale adjustment techniques: One is an origin point based adjustment technique and the other is a specific or interest region adjustment technique. The origin point based adjustment technique depends on a start point of each media object, whereas the specific region adjustment technique is based on an interest or importance region determined by the user within the region of said each media object. By composing the temporal relations and the temporal scale object decided above, a SYNC object for each media object is now created at the SYNC object generator 20. Data on each of the SYNC objects created at the SYNC object generator 20 is then transferred to the video stream object generator 40.

In the meantime, at the spatial composition object generator 30, spatial composition objects are created. To create the spatial composition objects, the spatial relations between the motion picture object and each of the spatial media objects are first determined and then spatial scale

object for each media object is created based on the spatial relations. Each spatial relation refers to a function of a position and a size of a region of each media object on the motion picture object being represented on the screen. As described above, the position of the region is expressed as a coordinate (X, Y) with respect to a coordinate origin positioned at an upper left corner of the region and the size thereof represents a horizontal and a vertical lengths in units of pixel of the region on a horizontal and a vertical axes. Fig. 4 depicts an exemplary drawing for explaining spatial relations between the media objects on the basis of the motion picture object in accordance with the invention. In Fig. 4, for example, the position of the text object is given by a coordinate (10, 280) and as for the size thereof, the horizontal length is 280 and the vertical length is 10. Of course, as discussed, unit of the length is pixel.

For the creation of the spatial composition objects, in accordance with the invention, there are further set a priority representing the playback order of the media objects and a movement object depicting a movement direction and a movement speed of a region of each media object being displayed on the screen. Using the movement object, it is possible to adjust the position of each media object during the playback thereof. In accordance with a preferred embodiment of the invention, the movement direction is set to be one along the left, right, upper and lower; and the

movement speed is decided as the number of pixels per a frame in the motion picture object.

As in the SYNC object generator 20, the size of the region of each media object being displayed on the screen can also be adjusted by using a spatial scale object which will be described in detail hereinafter. The spatial scale object is used to adaptively adjust the spatial feature of each media object to satisfy the requirements of the specification defined in the motion picture object. The spatial scale object is defined as a function of a position and a size of a region of each media object being displayed on the screen. Also the spatial scale object may employ either one of the origin point based adjustment technique and the specific region adjustment technique fully described above. Of course, it is evident that the origin point based adjustment technique depends on a point positioned at an upper left corner of the region. Using the spatial relations and the spatial scale object, the priority and the movement object, a spatial composition object for each media object is now created at the spatial composition object generator 30. Data on each of the spatial composition objects created is then provided to the video stream object generator 40.

At the video stream object generator 40, a desired video stream object is created by composing the temporal relations and the temporal scale object from the SYNC object generator 20 and the spatial relations and the spatial scale object from

the spatial composition object generator 30. The created video stream object may be a desired edited one or may be used as a reference object to create a different video stream object. As discussed above, the present invention employs an objected-oriented multimedia data editing scheme which takes account of the temporal and the spatial relations between the media objects on the basis of the motion picture object; and, therefore, it is possible to create all desired objects and to accomplish an accurate synchronization between a motion picture media and other media in the object.

While the present invention has been described with respect to certain preferred embodiments only, other modifications and variations may be made without departing from the scope of the present invention as set forth in the following claims.

Claims:

1. A method for generating a desired video stream object from multimedia data having the form of a video stream in a data editing system, comprising the steps of:

(a) extracting primitive objects having a rectangular object, a position object and an interval object by using head information in the multimedia data;

(b) creating media objects based on the multimedia data and the primitive objects, wherein the media objects are classified into temporal and spatial objects;

(c) determining temporal relations among the media objects, wherein each temporal relation represents a playback start time and a playback length of a corresponding media object on the basis of a motion picture object out of the media objects and creating a temporal scale object to adjust the playback length of the corresponding media object based on the temporal relation thereof;

(d) determining spatial relations among the media objects wherein each spatial relation represents a position and a size of a region of a corresponding media object being represented on a screen of the system and creating a spatial scale object to control the size of the region based on the spatial relation thereof; and

(e) creating the desired video stream object based on the temporal relations and the temporal scale object and the

spatial relations and the spatial scale object.

2. The method of claim 1, wherein the interval object represents a playback interval of the corresponding media object and the position object and the rectangular object depict the position and the size of the region of the corresponding media object being represented on the screen, respectively, wherein the playback interval is defined as a function of a playback start point and a playback end point of the corresponding media object, the position of the region is expressed as a coordinate with respect to a coordinate origin on a horizontal and a vertical axes, and the size of the region is defined as a function of a horizontal and a vertical lengths in units of pixel on the horizontal and the vertical axes.

3. The method of claim 2, wherein the temporal and the spatial scale objects selectively employ one of an origin point based adjustment technique and a specific region adjustment technique to adjust the playback length of the corresponding media object and the position and the size of the region of the corresponding media object, respectively, to synchronize it with the motion picture object, wherein the origin point based adjustment technique depends on, for the temporal scale object, a playback start point of the corresponding media object and, for the spatial scale object,

a point positioned at an upper left corner of the region of the corresponding media object; and the specific region adjustment technique is based on an interest region set by the system user, the interest region being defined as a region where the user regards it as an interest region within the region of the corresponding media object being represented on the screen.

4. The method of claim 3, wherein the step (d) includes a step of setting a sequential order of the media objects to be represented on the screen.

5. The method of claim 4, wherein the step (d) further includes a step of creating a movement object to change the position of each media object during the playback thereof, wherein the movement object depicts a movement direction and a movement speed of said each media object to be represented on the screen.

6. An apparatus for generating a desired video stream object from multimedia data having the form of a video stream in a data editing system, the apparatus comprising:

means for extracting primitive objects having a rectangular object, a position object and an interval object by using head information in the multimedia data and creating media objects based on the multimedia data and the primitive

objects, wherein the media objects are classified into temporal and spatial objects;

means for determining temporal relations and spatial relations among the media objects wherein each temporal relation represents a playback start time and a playback length of a corresponding media object on the basis of a motion picture object out of the media objects and each spatial relation depicts a position and a size of a region of a corresponding media object being displayed on a screen of the system;

means for creating a time scale object to adjust the playback length of the corresponding media object based on the temporal relation thereof and creating a spatial scale object to control the size of the region of the corresponding media object based on the spatial relation thereof; and

means for generating the desired video stream object based on the temporal and the spatial relations and the temporal and the spatial scale objects.

7. The apparatus of claim 6, wherein the interval object represents a playback interval of the corresponding media object and the position object and the rectangular object depict the position and the size of the region of the corresponding media object being represented on the screen, respectively, wherein the playback interval is defined as a function of a playback start point and a playback end point

of the corresponding media object, the position of the region is expressed as a coordinate with respect to a coordinate origin on a horizontal and a vertical axes, and the size thereof is defined as a function of a horizontal and a vertical lengths in units of pixel on the horizontal and the vertical axes.

8. The apparatus of claim 6, wherein the temporal and the spatial scale objects selectively employ one of an origin point based adjustment technique and a specific region adjustment technique to adjust the playback length of the corresponding media object and the position and the size of the region thereof, respectively, to synchronize it with the motion picture object, wherein the origin point based adjustment technique depends on, for the temporal scale object, a playback start point of the corresponding media object and, for the spatial scale object, a point positioned at an upper left corner of the region of the corresponding media object; and the specific region adjustment technique is based on an interest region set by the system user, the interest region being defined as a region where the user regards it as an interest region within the region of the corresponding media object being represented on the screen.

9. The apparatus of claim 8, wherein the temporal and spatial relation determining means includes means for setting

a sequential order of the spatial media objects to be represented on the screen.

10. The apparatus of claim 9, wherein the temporal and spatial relation determining means further includes means for creating a movement object to change the position of each media object during the playback thereof, wherein the movement object represents a movement direction and a movement speed of said each media object to be represented on the screen.

11. A video stream object generation apparatus constructed and arranged substantially as herein described with reference to or as shown in Figs. 1-4 of the accompanying drawings.

The Patent Office

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Claims searched: 1 to 11

Examiner: John Donaldson
Date of search: 28 April 1999

Patents Act 1977
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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.6): H04N 5/00, 5/222, 5/262, 5/265, 5/272, 5/278, 9/00, 9/64, 9/74, 9/76

Other: Online:WPI, EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	WO 97/39411 A1 (AVID TECHNOLOGY), see abstract	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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